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RESULTS ACHIEVED IN 1950 BY DEPARTMENTS OF CHEMICAL, BIOLOGICAL, TECHNICAL, AND PHYSICOMATHEMATICAL SCIENCES, ACADEMY OF SCIENCES USSR

A. V. Topchiev

The following information is taken from an extensive report on the activity of all departments of the Academy of Sciences USSR during 1950, presented by A. V. Topchiev, chief scientific secretary of the Presidium of the Academy of Sciences USSR, at the annual meeting of the academy held on 2 February 1951.

Department of Chemical Sciences

In 1950, institutes of the Department of Chemical Sciences achieved results which are of great theoretical and economic importance. Thus, new polymerizing materials have been synthesized and are being introduced into practice (Academician A. N. Nesmeyanov, V. V. Korshak). Signal success has been achieved in the synthesis of new steroid compounds (I. N. Nazarov Corresponding Member, Academy of Sciences USSR).

Work in the following fields proceeded successfully: prevention of corrosion of metals; application of plasticizers for cement and concrete; production of thick oxide films on aluminum and aluminum alloys (N. D. Tomashov, Doctor of Chemical Sciences), work on dolomites, which is of practical importance for hydraulic construction. Work on highly coercive alloys and investigations which are of great importance for the industry of noble metals (B. G. Tronev, Doctor of Chemical Sciences) was completed. A new biogeochemical method to be used in prospecting for nickel and chromium was developed and tested. Tracer atoms are used extensively for checking and improvement of analytical methods. The technique of chromatographic separation and isolation of rare elements is being developed.

Notwithstanding some improvement in the work of the department, certain substantial faults have not yet been eliminated from its activity. This refers to the excessive number of investigations being carried out and duplication both within the institutes and with respect to work done at different

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institutes (in the fields of electrochemistry, catalysis, etc.). As a result of dispersion of effort, some work has been continued for many years without being applied in practice. For instance, Ya. T. Eydus, Doctor of Chemical Sciences, has worked on the hydrocondensation of olefins since 1946 without any practical results:

There is still an irresponsible attitude towards carrying out assignments. Thus, the Laboratory of Peroxidic Compounds (S. Z. Makarov, Doctor of Chemical Sciences) has not completed a number of assignments.

Among the most important results transmitted to the industry one may note: (1) methods for the production of polyamide resins (V. V. Korshak), (2) a new method for the preparation of diazophenolsulfonic acids (Academician V. M. Rodionov and V. K. Matveyev, Candidate in Chemical Sciences), (3) a new rustless steel (G. V. Akimov, Corresponding Member, Academy of Sciences USSR), and (4) a new method for the anodic treatment of aluminum and its alloys (N. D. Tomashov, Doctor of Chemical Sciences).

Notwithstanding these successes, the amount of completed research that resulted in industrial applications was too meager in 1950. This is due to an inadequate concentration of effort on the principal lines of research and insufficient contacts with industry. Thus, the work of A. F. Kapustinskiy, Corresponding Member of Academy of Sciences USSR, A. I. Kitaygorodskiy, Doctor of Physicomathematical Sciences, and B. M. Neyman, Doctor of Chemical Sciences, is not connected with urgent problems of the national economy.

The introduction of the results of some work is being unduly delayed. For example, the work of Academician P. A. Rebinder on compounds lowering hardness, which was continued for more than 10 years, has not yet been completely utilized as far as practical applications are concerned.

The plan of introduction into practice included investigations which had not been sufficiently adapted. There was not always adequate agreement with the organizations that were interested. Control exercised by the management of institutes and the Bureau of the department over the plan of introduction into practice was inadequate. Occasionally, some institutes forgot to introduce the results of completed investigations. Thus, the Institute of Organic Chemistry, Academy of Sciences USSR, forgot about the valuable work carried out by the late Honorary Academician M. A. Il'inskiy.

The management of the Bureau of the department did not take every possible measure for improving the work of the department. Specifically, the executive personnel of the department was not utilized to a sufficient extent for amelioration of the work of the institutes. Assignments are not being distributed evenly between the executive workers of the department.

Training of executive scientific personnel is slow and an inadequate number of people are being trained. As a result, many of the most important branches of chemistry, which must take care of the urgent demands made by the national economy (for instance, in the fields of catalysis, ultrahigh pressures, intermediates and dyestuffs, and chemical thermodynamics), are represented by individual scientists only. These scientists do not prepare cadres of young workers who would be able to continue research along the lines in question.

In the light of suggestions made by Comrade Stalin in his works on the study of languages, most institutes have discussed problems with which scientific workers are faced. In the course of these discussions, measures for the critical consideration of individual problems of science were outlined. At

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meetings of the Scientific Council of the Institute of Organic Chemistry, a discussion of questions in the field of the theory of structure and "theory" of resonance has been conducted. An extensive discussion of the questions involved was started thereby.

The department is making preparations for an extensive meeting devoted to a discussion of the theory of chemical structure that was created by A. M. Butlerov. At this meeting the "theory" of electronic resonance, which rests on a methodologically unsound idealistic foundation, will be subjected to criticism. The theory of resonance has been accepted uncritically and propagandized by some USSR chemists (Ya. K. Syrkin, Corresponding Member of Academy of Sciences, M. Ye. Dyatkina, Doctor of Chemical Sciences, A. I. Kipriyanov, Active Member, Academy of Sciences Ukrainian SSR, and A. I. Vol'kenshteyn, Doctor of Chemical Sciences).

A critical consideration, from the methodological standpoint, of theoretical investigations in the field of kinetics of chemical reactions, as well as of Academician I. I. Chernyayev's work on the trans-effect, will take place in 1951.

Increased attention must be given in 1951 to organization of creative discussions which will stimulate further development of chemical science, as well as to the introduction of scientific achievements into the national economy. The Bureau of the department and the management of institutes must expedite the execution of work that is based on actual demand on the part of the industry. Every effort and all available means must be concentrated on such work. Dispersion of effort and duplication must be avoided, so that the 1951 plan will be fulfilled without fail.

Department of Biological Sciences

As far as the Department of Biological Sciences is concerned, the joint session of the Academy of Sciences USSR and the Academy of Medical Sciences USSR on questions of physiology was of great significance. As a result of the discussion which took place in connection with this session, cardinal errors and serious drawbacks in the work of a number of institutions and of leading scientific personnel were disclosed. By merging the Physiological Institute imeni I. P. Pavlov with two physiological institutes of the Academy of Medical Sciences USSR, the new Institute of Physiology imeni I. P. Pavlov, Academy of Sciences USSR, was created. In addition, the new Moscow Institute of Higher Nervous Activity was founded. A number of leading scientific workers who impeded the creative development of Pavlov's teachings were replaced.

By a decision taken at a combined session of the Presidium of the Academy of Sciences USSR and of Medical Sciences USSR, the Scientific Council on Problems of Academician I. P. Pavlov's Physiological Teaching was created. This council aims to coordinate and direct the activities of all USSR physiological institutes in such a manner that the scientific legacy left by Pavlov will be developed creatively.

Professor O. B. Lepeshinskaya's work on noncellular forms of life and the formation of cells from noncellular living matter was discussed extensively. As a result, institutes of the department launched research on new biological problems. Thus, the Institute of Biochemistry has started investigations on the metabolism of noncellular forms of life.

A new approach is being made to the problem of regeneration. Although it was formerly held that some tissues and organs (for instance, striated muscles, the liver, and the lung) are incapable of regeneration, work done at the Institute of Animal Morphology proved that such tissues do regenerate.

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In the field of metabolism, conditions under which protein molecules are capable of amino-acid exchange were established in the course of work done under the direction of the Institute of Biology. The biosynthesis of amino acids in plan by direct amination was discovered.

In the field of heredity (work on which is headed by the Institute of Genetics), it has been proven experimentally that one may transform one species of plant into another by changing external conditions. This puts the problem of the origin of species on a new basis and furnishes material for the criticism of obtuse evolutionism in biology.

In connection with the problem of interdependence between the organism and its exterior medium, the Institute of Animal Morphology developed a method for regenerating corneas by transplanting sections of embryonal skin.

In the course of work on the general problem of obtaining high and stable agricultural yields, the Institute of Plant Physiology imeni K. A. Timiryazev developed and introduced into practice an effective method for delaying the sprouting of potato tubers. This method permits the loss in weight of potatoes due to long storage to be reduced by 3-6 times. A new method for preventing the premature shedding of cotton bolls has been developed and tried. An average 25% increase in the yield of cotton can be achieved by applying this method.

At the Botanical Institute, new and highly productive varieties of rubber-bearing plants have been developed.

High-vacuum molecular distillation of Vitamin A is being developed for application on an industrial scale.

Department of Technical Sciences

In general, the work of the Department of Technical Sciences on the 1950 plan was superior to the work done under the 1949 plan, as far as solution of problems put before science by the national economy is concerned. As a result of completed work on the projects in question, the Power Institute imeni G. M. Krzhizhanovskiy has made definite suggestions in regard to the loading (compensation) of ac lines for the transmission of power to Moscow from the Kuybyshev and Stal'grad hydroelectric plants. The Petroleum Institute has made practical suggestions concerning the intensification of petroleum production and the bounding of definite areas in which prospecting for petroleum and gas is to be carried out in Transcaucasia. The Mining Institute developed projects for the transfer of Kuznetsk Basin mines to operation with filling-in of worked-out space. The Institute of Metallurgy has developed a new technological procedure for the smelting of titanium-magnetite ores.

Of 283 subjects planned by the Department of Technical Sciences for 1950, three were not completed. The Power Institute has not completed work on fundamental schemes for the utilization of sun energy (former director, F. F. Molero). The Institute of Metallurgy has not carried out experimental work on the formation and condensation of metal vapors (director, D. V. Chizhikov, Corresponding Member Academy of Sciences USSR). The Institute of Automatics and Telemechanics has not produced an installation for telecontrol and telemetering (director, M. A. Gavrilov Doctor of Technical Sciences).

At the Institute of Mechanics, theoretical results are not always brought to the stage of engineering design and experimental checking. On the other hand, at the Institute of Automatics and Telemechanics, there is too much empiricism and not enough theoretical work.

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The journals of the department do not publish any articles on methodological questions.

The contacts of the department with industry cannot be regarded as adequate. The department's 1951 plan has been modified towards greater concentration on fewer subjects and towards the solution of the most important tasks set by the national economy and formulated in government directives. It is regrettable that other departments have not carried out any such reorganization.

Department of Physicomathematical Sciences

The most important achievements of the Department of Physicomathematical Sciences in 1950 are:

The development of a new viewpoint on the nature of the chemical bond connecting atoms of activating admixtures with the lattice of the luminophore; new, more economical phosphors for luminescent bulbs; materials of extra-strong anisotropic structure and electrical insulating materials; superconducting alloys from nonsuperconducting metals; development of new equipment for the application of methods of luminescent analysis and of the combination scattering of light; development of new theoretical foundations for the application of statistical methods of analysis and control in production; work on the forecasting of earthquakes.

In 1951, this department ought to pay particular attention to raising the responsibility for fulfillment of the plan; to assimilation by all scientists of the Marxist-Leninist theory and its creative application to the solution of scientific problems; and to the organization of broad discussions on urgent problems of contemporary science such as those which are encountered in cosmogony, weather forecasting, and the formulation of the philosophical foundations of physicomathematical sciences.

The department must make timely preparations for the World Congress of Astronomy which will be held at Leningrad in August 1951 and take steps to assure that this congress will be conducted in an exemplary manner.

In regard to work done by affiliates of the academy, the following investigations completed in 1950 are noteworthy:

At the Western Siberian Affiliate, a new type of pneumatic hammer has been designed. The efficiency of these hammers is more than twice as high as that of existing types. Introduction of the new hammers on a broad scale will result in an economy of tens of millions of rubles per year merely by reducing the consumption of compressed air.

The affiliates have drafted geological maps to be used in estimating the probability of the occurrence of ores of ferrous and nonferrous metals as well as of petroleum.

Special work on the design of a magnetic device to be used in prospecting for minerals has been done at the Ural Affiliate. The novel features of this device are that it can be used at any time of the year and that it functions while the observer is in motion. The Ministry of Geology USSR, has accepted the new device for continuous production.

Considerable activity has been developed at the Kazan', Crimea, Turkmen, and Ural affiliates for the purpose of aiding the huge construction projects of the Stalin period.

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